March 17, 1931. E. HARA 1,796,990

CIRCUIT BREAKER OPERATING MECHANISM

Filed May 2, 1930

Fig. 1.

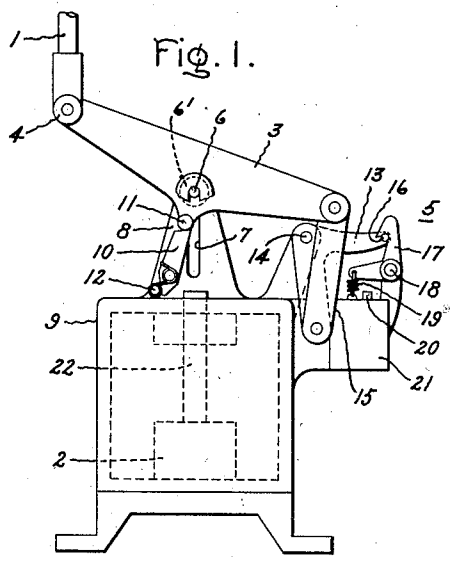


Fig. 2.

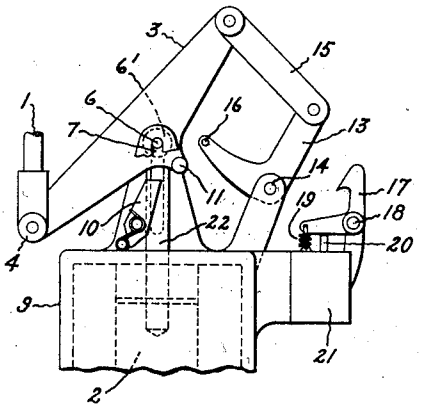
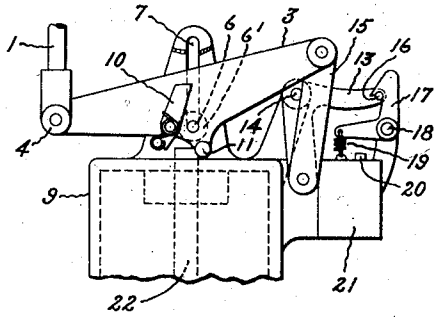


Fig. 3.



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UNITED STATES PATENT OFFICE

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CIRCUIT-BREAKER-OPERATING MECHANISM

Application filed May 2, 1930, Serial No. 449,805, and in Japan June 17, 1929.

My invention relates to operating mechanisms for circuit breakers, and more particularly to the trip-free type thereof wherein the operative connection between the actuating means and the circuit breaker operating member is immediately disengaged or rendered inoperative in response to actuation of the tripping mechanism, thereby permitting opening movement of the circuit breaker independently of the operation of the actuating means.

It is an object of my invention to provide an improved operating mechanism for circuit breakers which shall be simple in construction and reliable and efficient in operation.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawing, Fig. 1 is an elevational view of circuit breaker operating mechanism embodying my invention in the closed circuit position thereof; Fig. 2 is a fragmentary view of the mechanism illustrated in Fig. 1 in another position, and Fig. 3 is a fragmentary view illustrating the mechanism in an initial position prior to the switch closing operation.

In Fig. 1 there is illustrated an operating mechanism of the trip-free type for circuit breakers comprising the circuit breaker operating rod 1, the actuating means 2, which by way of example is shown as a solenoid, and a floating member or lever 3 connected at one end, as at 4, to the operating rod 1 and at its other end to latching means 5 hereinafter described. The floating lever 3 is provided at its central portion with a roller 6′ and a pivot pin 6 which is guided for vertical movement within a slot 7 formed in the stationary structure or lug 8 mounted on the solenoid casing 9. Accordingly, the central portion of lever 3 may, under certain conditions, move bodily in a vertical direction by reason of the aforesaid lost-motion connection.

Assuming that the latching means 5 restrains the corresponding end of the lever 3 from rotation, it is apparent that the central portion of the floating lever must be held or supported in its closed circuit position when the actuating means is deenergized, as illustrated in Fig. 1, in order to prevent downward or opening movement of the switch operating rod 1. For this purpose, there is provided disengageable supporting means, as the pivoted lug 10, which is adapted to support and to be engaged by the offset portion 11 comprising a part of the lever 3. The pivoted lug 10 is resiliently biased against the stop-pin 12 so that it may be cammed in a counter-clockwise direction by the offset portion 11 prior to its supporting engagement with the floating lever. It will be apparent, of course, that the disengageable support may take other forms than the pivoted lug herein illustrated, and by way of example, a simple toggle interconnecting the floating lever 3 and the stationary structure may be employed and arranged so as to be overset or locked in the supporting position thereof.

The latching means 5 for restraining one end of the floating lever 3 under predetermined conditions, comprises a bell crank 13 pivoted as at 14 to fixed supporting structure and connected by link 15 with the lever 3. The other arm of the bell crank is provided with a pin 16 adapted to be engaged by a latch 17 for holding the bell crank 13, and consequently the floating lever 3, from counter-clockwise rotation. The latch 17 is pivotally mounted at 18 and is normally biased by a spring 19 towards latching position, from which position it may be moved by the plunger 20 of the usual tripping coil 21.

When the mechanism is in its closed circuit position, actuation of the latch 17 by the tripping coil, or by other suitable means, releases the pin 16 so that the bell crank 13 is free to rotate in counter-clockwise direction, thereby permitting corresponding rotation of the floating lever 3 about its central pivot 6. In the position illustrated in Fig. 2 the floating lever 3 has rotated about its guide pivot pin 6 as a center so that the member 11 is no longer engaged by the supporting lug 10. It

will be noted, however, that the operating rod 1 is in its open circuit position by the time the floating lever 3 is disengaged with respect to its central support. Immediately upon collapse of the central support the floating lever is permitted to move bodily downward to the position illustrated in Fig. 3 wherein the bell crank 13 again has been rotated clockwise to engage the latch 17 and effect resetting engagement. The roller 6′ is likewise in an initial position for actuation by the solenoid plunger rod 22.

In order to effect the switch-closing operation the solenoid 2 is energized, thereby causing the rod 22 to move upwardly and engage the roller 6′ to rotate the floating lever 3 about its latched end to the position illustrated in Fig. 1. As the lever 3 is rotated to this position, the offset portion 11 rides along the edge of the supporting lug 10, biasing it counter-clockwise against its spring until it reaches the top edge thereof, whereupon the lug snaps under the portion 11 to support the lever in closed circuit position.

In the event that the circuit breaker is to be tripped during the closing operation, as for example, when an abnormal circuit condition obtains, the actuation of latch 17 by the trip coil permits the floating lever 3 immediately to rotate about the roller 6′, which is engaged by the solenoid plunger, to the position illustrated in Fig. 2. Accordingly, the operating mechanism is trip-free during any part of the closing operation and in any position of the actuating means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. Operating mechanism for circuit breakers comprising in combination a switch operating rod, a floating member operatively connected to said rod, means for restraining one end of the floating member, actuating means operatively associated with the floating member for rotating the same about its restrained end and effecting circuit closing movement of said rod, and structure comprising a disengageable support for said floating member in its closed circuit position, said floating member adapted to be released with respect to said support in response to actuation of said restraining means during the switch opening operation.

2. Switch operating mechanism comprising in combination an operating rod, a floating lever connected to said rod, latching means for restraining one end of said floating member, actuating means operatively associated with said floating lever for effecting switch closing movement of said rod, said floating lever being provided with a movable pivot intermediate its ends, and disengageable means for supporting said pivot in fixed position in the closed circuit position of said lever, said disengageable means adapted to permit release of the movable pivot during the switch opening operation in response to actuation of said latching means.

3. Switch operating mechanism comprising a switch operating rod, a floating lever connected thereto, said floating lever having a vertically movable and guided pivot, latching means for restraining one end of said floating lever in a circuit closing position, actuating means for rotating the floating lever about its latched end and causing a switch closing operation, and a disengageable support adapted to hold said guided pivot in a fixed position in the closed circuit position of the floating lever, said pivot adapted to be released with respect to said support in response to actuation of said latching means during the switch opening operation.

4. Switch operating mechanism comprising a switch operating rod, a floating lever pivotally connected at one end thereto, latching means operatively related to the other end of said lever, actuating means for rotating said lever with respect to its latch engaged end for effecting circuit closing movement of said operating rod, and a disengageable connection for holding said lever in the closed circuit position thereof, said lever adapted to rotate with respect to said disengageable connection to open circuit position in response to actuation of said latching means.

5. In switch operating mechanism comprising a switch operating rod and actuating means therefor, trip-free mechanism interposed between said actuating means and operating rod comprising a floating lever, said lever being connected at one end to the operating rod and at its other end to latching means, guiding means for permitting bodily movement of the central portion of said lever, said actuating means adapted to engage said central portion and rotate the floating lever about its latched end to effect circuit closing movement of the operating rod, and means adapted to hold the central portion of the floating lever in its closed circuit position, said lever adapted to be released with respect to the said holding means in response to actuation of the latching means during the circuit opening operation for permitting rotative and bodily movement of the floating lever.

6. In switch operating mechanism comprising a switch operating rod and actuating means therefor, the combination comprising a floating lever connected at one end to said operating rod and at its other end to latching and tripping means, said lever being provided with a central pivot having a lost-motion connection with stationary structure, a solenoid adapted to rotate said floating lever about its latched end to effect circuit closing movement of the operating rod, and a pivoted lug adapted to engage the central portion of said floating lever for supporting

it in closed circuit position, actuation of said tripping means being effective to permit rotative movement of the floating lever and disengagement thereof from said lug whereby said operating rod is permitted to move to open circuit position independently of the position of the actuating solenoid.

7. The combination with switch operating mechanism comprising a switch operating rod and actuating means therefor, of trip-free structure disposed between said actuating means and operating rod comprising a floating lever connected at one end to said rod, latching means for retraining the other end of said lever, said actuating means adapted to engage a central portion of the floating lever to rotate said lever about its latched end for effecting switch closing movement of said rod, and disengageable supporting means coacting with said central portion for maintaining the floating lever in its closed circuit position whereby tripping of the latching means permits rotation of the floating lever with respect to said central portion during the switch opening movement, said floating lever being disengaged from its supporting means in response to said movement for permitting it to move bodily to an initial resetting position.

8. The combination with switch operating mechanism comprising a switch operating rod and actuating means therefor, of trip-free structure disposed between said actuating means and operating rod, comprising a floating lever connected at its one end to said rod and at its other end to latching means adapted to restrain that end of the lever, said actuating means adapted to engage the floating lever intermediate its ends to rotate it about its latched end for effecting switch closing movement of said rod, and means for permitting rotation of said floating lever about its central portion in response to actuation of said latching means whereby said operating rod may move to open circuit position independently of the position of said actuating means.

9. Operating mechanism for circuit breakers comprising in combination switch operating means, a floating member operatively connected to said means, means for restraining a portion of said floating member, actuating means operatively associated with the floating member for rotating the same about its restrained portion and effecting circuit closing movement, and a movable support for said floating member in its closed circuit position, said floating member arranged so as to be released with respect to said support in response to actuation of said restraining means during the switch opening operation.

10. Switch operating mechanism comprising a switch operating rod, a floating lever operatively connected to one end of said rod, latching means for restraining one portion of said lever, actuating means for rotating said lever about said latched portion for effecting circuit closing movement, and a disengageable connection for holding said lever in the closed circuit position thereof, said lever arranged to rotate with respect to said connection towards open circuit position in response to actuation of said latching means.

In witness whereof, I have hereunto set my hand this fifteenth day of April, 1930.

EI HARA.